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## **Sports massage as a method of preventing delayed onest muscle soreness**

**<sup>1</sup>Pawel Choroszewicz, <sup>1</sup>Anna Maria Dobosiewicz, <sup>2</sup>Nataliia Badiuk**

**<sup>1</sup>Scientific Circle of Exercise Physiology at Department of Hygiene, Epidemiology and Ergonomics. Division of Ergonomics and Exercise Physiology, Nicolaus Copernicus Univeristy in Toruń, Collegium Medicum in Bydgoszcz, Poland**

**<sup>2</sup>State Enterprise Ukrainian Research Institute for Medicine of Transport of Ukrainian Ministry of Health Care", Odesa, Ukraine**

### **Abstract**

Physical activity, despite it's many advantages for health and fitness, can have negative effects on humans. One of them may be delayed muscle soreness (DOMS), which appears 48-72 hours after the end of training. People performing intensive training, performing eccentric exercises, as well as people who take up activity once in a while are exposed. DOMS can meet both qualified athletes and amateurs of sport.

There is a collage of hypotheses explaining the formation of delayed muscle soreness. The most recent one is that DOMS is the result of muscle micro-injuries. There is also no single effective method of pain treatment. Pharmacology, hot and cold treatment methods, stretching and massage are applied. Research on athletes as well as amateur athletes shows that sports massage leads to faster regeneration of muscles affected by DOMS.

**Key words: delayed muscle soreness; DOMS; massage; sports massage.**

## **Introduction**

DOMS, i.e. delayed muscle soreness is caused by eccentric efforts or after previously unknown exercises for the trainer. However, there is no certainty as to the etiology of the disease [15, 18]. The most common hypothesis, however, is that this pain is associated with ultrastructural muscle damage [3, 15]. Further, protein degradation, apoptosis and local inflammatory response are observed [3].

The DOMS affects people who perform physical activities irregularly, people starting their adventure with sport, as well as professional athletes [18].

The development of DOMS has the greatest culmination of symptoms 48-72 hours after the activity [9, 15]. The sensation of pain increases and begins to manifest itself most often after 12-48 hours after the end of activity, whereas it passes after several days [18].

The course of muscle soreness with delayed onset is observed:

- Decreased strength
- Restriction of traffic with soreness
- Stiffness
- Swelling [3, 4].

The given symptoms may appear and intensify at various times:

- The reduction in strength is greatest immediately after training or after 48 hours. It usually passes after about 5 days.
- Pain and tenderness are at their peak 1-3 days after exercise and improve about 7 days after exercise.
- Stiffness and oedema have their apogee 3-4 days after exercises, whereas they disappear within 10 days [4].

The intensity of DOMS sensation may be different for each trainer. It depends mainly on the sensitivity of nociceptors and ongoing inflammatory processes in the body. Depending on these factors, different levels of pain may be experienced [18].

DOMS affects physical fitness, motor coordination and muscle strength [15]. It may be a reason for deteriorating sports performance [3].

Over the years, the best treatment for delayed muscle soreness has been sought. The aim was to enable the muscles to return to normal functioning as soon as possible after training [3].

There are no clear guidelines for the treatment of DOMS [15, 18]. Among the therapeutic methods in prevention or elimination of DOMS there are:

- Cryotherapy
- Pharmacology

- Ultrasounds
- Electrical stimulation
- Massage
- Stretching
- Light exercises
- Rest
- Hyperbaric oxygen therapy [4].

Non-steroidal anti-inflammatory drugs are recommended from pharmacological methods; however, their effects have not been clearly defined [3, 4]. The drugs used include aspirin, naproxene, flurbiprofen, ibuprofen, diclofenac, ketoprofen. Unfortunately, the use of non-steroidal inflammatory drugs may be associated with numerous negative effects. This includes them:

- Stomach and intestinal disorders
- Kidney function disorders
- Hypertension

The action of nesteroid anti-inflammatory drugs depends on the dose and time of intake [3]. Smaller doses of NSAIDs give analgesic effects and higher anti-inflammatory effects [4].

The manual techniques attributed positive effects to massage. It has been concluded that it's effects depend on the duration and type of techniques used.

Among massages, not only manual massage is used. Massages using ice [19] and heat are used [13].

Among athletes, many sports trainings assume daily activities. In such situations, people affected by DOMS should perform less intensive exercises for the next day or two and shorten the exercise time. A good solution may also be to perform exercises on parts of the body that are not controlled by DOMS. In order to be able to prevent this type of injury, eccentric exercises should be introduced gradually [3].

### **Massage**

The following article is focused on checking the operation of the massage as a method to prevent DOMS.

Massage has many benefits for the human body. Under the influence of massage there is an increase in blood flow, muscle tension is reduced, mood improves. Massage can increase the range of movement in the joints and reduce passive and active stiffness. An appropriately selected massage technique may reduce or increase nervous excitability [17]. The massage can increase the capacity of the muscle to work 2-3 times already after 5 minutes of massage.

Moreover, the massage improves the heart rate - reduces blood resistance in the arteries and increases venous outflow. The respiratory rate is slowed down. It affects the rheumatoid nerves and nerve plexuses [21].

Sports massage helps to prepare for intensive physical activity, control fatigue after exercise and increase the possibilities to achieve sports results. This massage is recommended for both athletes and amateur athletes [21]. The massage is a frequently used agent in the fight against DOMS [6, 15].

Sports massage allows to counteract adverse effects of increased physical activity. It is similar to classical massage, but the techniques performed during sports massage are longer and more energetic. Sports massage has the following functions:

- Warming up before training or competitions
- Regeneration after a long effort
- Injury support

Sports massage can be divided into several groups, depending on the task it performs:

- Supporting massage - Conditioning massage
- Pre-effort and preventive massage
- Inter-workout regeneration massage
- Post-workout massage.

When performing a sports massage you should keep in mind:

- Sex of the athlete
- Age
- Training status
- Body area to massage

For women and younger players the massage should be less intense. The type of discipline practiced is also important in the way of massage. People who perform more technical and precise sports should be massaged with less force. Persons undertaking strength and endurance activities, who are characterized by high muscle mass should be massaged more intently, with more force. Trainers with a prevalence of the parasympathetic system can also be massaged more vigorously. Those with a preponderance of the parasympathetic system can also be massaged more gently. Which area is subject to the massage depends on the muscles that are mainly involved in the work during the activity. The whole body massage is performed after general exercises. A partial body massage is performed on the part of the body that took the greatest part in the exercise [16].

Kargarfard et al. in their research examined the influence of the massage on bodybuilders' performance. For this purpose, a group of 30 bodybuilders was gathered, who were randomly divided into two groups. After strength training, one of the groups, consisting of 15 bodybuilders, held a 30-minute sports massage session. The second group did not take any additional actions to regenerate. To assess performance after training the following were measured: plasma creatine kinase (CK) level, vertical jump test, isometric torque and pain test, agility and jump test. the group of bodybuilders who received massage sessions after training had better regeneration levels [11].

Other studies compared the effect of vibration therapy and massage as methods to prevent delayed muscle soreness. The study focused on checking the effects on women who do not regularly exercise. The study involved 45 women who were divided into three groups of 15 each. The singer from the group underwent 50 Hz vibration therapy for 5 minutes, in the second group a massage was performed for 15 minutes, the third group was a control group where no method of regeneration was given. After 24, 48 and 72 hours it was found that the group that received the vibration therapy and the group after the massage felt much less muscle pain than the control group. In this study, it was found that the massage and vibration therapy are equally effective [10].

Some researchers believe that a massage performed after an eccentric exercise can have a positive effect on DOMS but does not affect muscle function. For this purpose, 10 volunteers were tested in strength training. The study involved 5 women and 5 men. Exercises performed included exercises on elbow flexors. After 3 hours from the series of exercises, the trainers had a 10-minute massage on one arm. It was found that the DOMS in the arm with the massage was a monkey by 30% and the swelling was also reduced. It was found that the massage had no effect on muscle function [20].

Also Bakowski et al. tried to check the effect of sports massage on muscles which were subjected to heavy physical training. A group was formed consisting of 14 healthy men who had no experience in strength training. They performed eccentric and concentric exercises on elbow bend muscles. After performing 8 sets of exercises, after 30 minutes from the end of the training one arm was subjected to 10 minutes of massage. It was found that the pain in the arm subjected to the massage was 10-20 % miniscule compared to the unmassaged one. As in the previous study no difference in muscle function was found. Moreover, no effects of massage on muscle oedema were found [2].

Research carried out by Andersen et al. checked whether the active warming up of the muscles during exercise is as effective as a massage to prevent DOMS. A randomized

controlled blind study was conducted for this purpose. 20 participants of the study performed eccentric exercises on a biodex dynamometer. DOMS was found in the participants 48 hours after exercise. During this time 10 minutes of active shoulder exercises were performed in one group and 10 minutes of quadriceps muscle massage in the other. It was found that both active exercise and massage reduced the DOMS intensity [1].

The physiological and psychological effects of massage on delayed muscle soreness were studied. The study involved 18 people. Volunteers were divided into a control group and a group which held a massage session. 2 hours after the training in one group a massage was performed and in the other group a simulated massage. The study showed that the pain intensity decreased after 48 hours in the group undergoing massage, but muscle function did not improve [8].

The effects of massage on soreness and muscle function in men after a 40-minute walk on a treadmill with a load were studied. A load equal to 10% of the volunteer body weight was used for this purpose. The study involved 8 men. 2 hours after the treadmill, a massage was performed on one limb for 30 minutes. It was found that the limb that was not massaged was more tender and painful. There was no difference in isometric strength of both limbs. As in previous studies, it was found that the massage reduced muscle soreness but not its function [5].

Han et al. In their studies, they checked whether the massage, apart from affecting the DOMS, may also affect the gait after an intensive effort. The study participants performed isotonic exercises. They went up and down the stairs on the 5th floor 20 times. There were 10 people in the massage group who received a massage of the gastrocnemius muscle of the dominant leg. The study showed significant differences in perceived pain and walking. Correlations were found in reduced pain and walking performance after the massage [7].

The massage was also combined with other techniques preventing or reducing delayed muscle soreness. The study was carried out on 50 volunteers, divided into 2 groups. The effect of combining the massage, stretching and warming up to the massage itself was checked. For this purpose, both groups performed eccentric exercises for 30 minutes. In the first group a warm-up and stretching was additionally performed before the training started. It was found that a massage in combination with stretching and warming up can reduce the negative effects of eccentric exercises to a greater extent than the massage itself. The effects were observed in maximum strength, elbow flexion angle and creatine kinase activity in blood [12].

The studies carried out on ultramarathon also give positive findings as regards the effectiveness of massage in fighting DOMS symptoms. The ailment occurred in 95% of runners. In this activity, the lower limbs were the most exposed to DOMS. 220 people who completed

the run were given a massage within these structures. Once the symptoms were known, the massage proved to be an effective method in fighting the symptoms [14].

Frey-Law et al. performed a double-blind, randomized controlled study to check the effect of the massage on mechanical pain hysteresis and pain during DOMS. The study demonstrated that the massage may reduce the feeling of DOMS even by 25-50% [6].

### **Conclusion**

There is no single effective method to prevent delayed muscle soreness. From studies in which the effect of massage on DOMS was tested, positive effects can be found. The massage allows for a faster return to regeneration after an intensive or eccentric physical effort. It can be helpful for people who are professionally engaged in sports, as well as for beginners and amateur physical activity. Massage in delayed muscle soreness helps primarily in relieving pain, it has no effect on muscle function. There is also no clear evidence of the effectiveness of the massage in dealing with DOMS swelling. The effect of the massage combined with proper warming up and stretching of the body may bring better results, but more research is needed in this direction to carry out.

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